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UNIVERSITY OF LOUISVILLE

THE INCIDENCE OF HUMAN INFESTATION WITH TRICHINELLA SPIRALIS
AS REVEALED BY THE EXAMINATION OF 570 DIAPHRAGMS
AT THE LOUISVILLE GENERAL HOSPITAL
LOUISVILLE, KENTUCKY

A DISSERTATION

SUBMITTED TO THE FACULTY
OF THE GRADUATE SCHOOL OF THE UNIVERSITY OF LOUISVILLE
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF BACTERIOLOGY

BY

LETITIA S. KIMSEY

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NAME OF STUDENT: LETITIA S. KIMSEY

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TRICHINELLA SPIRALIS AS REVEALED BY THE
EXAMINATION OF 570 DIAPHRAGMS AT THE
LOUISVILLE GENERAL HOSPITAL
LOUISVILLE, KENTUCKY

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DATE: May 24, 1943

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I WISH TO EXPRESS MY SINCERE APPRECIATION TO DOCTOR J.A. KENNEDY, PROFESSOR OF BACTERIOLOGY, UNIVERSITY OF LOUISVILLE SCHOOL OF MEDICINE, FOR HIS HELPFUL CRITICISM AND DIRECTION, AND TO DOCTORS A.J. MILLER AND MALCOLM L. BARNES OF THE DEPARTMENT OF PATHOLOGY, WHO NOT ONLY WERE RESPONSIBLE FOR THE COLLECTION OF THE AUTOPSY MATERIAL USED IN THIS STUDY, BUT WHO GAVE SO GENEROUSLY OF THEIR TIME AND ADVICE. I AM ALSO INDEBTED TO MISS KATHERINE CHAPIN AND TO DOCTORS LOUIS SHERMAN, MALCOLM STANLEY AND ALBERT L. HIGDON FOR THEIR WORK AS RESEARCH ASSISTANTS IN THE DEPARTMENT OF BACTERIOLOGY.

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INTRODUCTION

WITH THE ADVENT OF IMPROVED METHODS OF EXAMINATION OF MUSCLE TISSUE FOR THE PRESENCE OF TRICHINELLA SPIRALIS AND THE DETECTION OF TRICHINOSIS BY THE SKIN AND PRECIPITIN TESTS, THERE HAS BEEN AN AWAKENING OF INTEREST IN THE DISEASE WHICH HAS RESULTED IN A GREATLY INCREASED VOLUME OF STATISTICAL DATA.

THE PRESENT SURVEY WAS UNDERTAKEN WITH THE THOUGHT IN MIND THAT IT MIGHT BE OF STATISTICAL INTEREST TO DETERMINE THE INCIDENCE OF INFESTATION WITH TRICHINELLA SPIRALIS IN PATIENTS COMING TO AUTOPSY AT THE LOUISVILLE GENERAL HOSPITAL. THIS INCIDENCE WAS DETERMINED BY THE EXAMINATION OF THE DIAPHRAGMS OF THESE PATIENTS.

HISTORICAL

ONE HUNDRED YEARS AGO DR. H.I. BOWDITCH OF BOSTON, MASSACHUSETTS, REPORTED THE FIRST CASE OF TRICHINOSIS IN THIS COUNTRY.

DR. BOWDITCH IN PERFORMING AN AUTOPSY UPON THE BODY OF A MAN NOTICED SMALL BODIES ATTACHED TO THE MUSCLE FIBERS. A CAREFUL EXAMINATION OF THESE BODIES REVEALED THE PRESENCE OF THE PARASITIC WORM, TRICHINELLA SPIRALIS. "THIS IS THE FIRST TIME, AS FAR AS I KNOW, THAT THE 'TRICHINA SPIRALIS' HAS BEEN NOTICED IN THIS COUNTRY", REPORTED DR. BOWDITCH IN HIS ARTICLE WHICH APPEARED IN THE BOSTON MEDICAL AND SURGICAL JOURNAL, MARCH 30, 1842.

APPARENTLY THE EXISTENCE OF THE MINUTE ENCYSTED FORM OF TRICHINELLA SPIRALIS WAS RECOGNIZED BY PHYSICIANS AND STUDENTS OF THE BIOLOGICAL SCIENCES MANY YEARS BEFORE AN ACTUAL DESCRIPTION OF THE PARASITE APPEARED IN THE LITERATURE.

ACCORDING TO GEORGE BLUMER (1939), FRIEDRICH TIEDEMANN FIRST DESCRIBED THE ENCAPSULATED AND CALCIFIED PARASITES IN A SHORT ARTICLE THAT APPEARED IN FRORIEPS NOTIZEN IN 1822. HOWEVER, THE SIGNIFICANCE OF THESE PARASITES WAS NOT RECOGNIZED AT THAT TIME, AND IT WAS NOT UNTIL 1833 THAT JOHN HILTON FIRST SUGGESTED THE PARASITIC NATURE OF THE WORM.

THE CREDIT FOR THE ACTUAL DISCOVERY OF THE PARASITE GOES TO DR. JAMES PAGET WHO IN 1835, AS A MEDICAL STUDENT, OBSERVED SMALL "SPICULAE" IN THE MUSCLES OF A BODY IN THE

DISSECTING-ROOM. WITH THE AID OF A MICROSCOPE LOANED TO HIM BY THE NOTED PHYSIOLOGICAL BOTANIST, ROBERT BROWN, PAGET STUDIED IN DETAIL THESE WORMS THAT WERE CAUSING SO MUCH CONCERN. HE COMMUNICATED THE FACTS TO THE ABERNETHIAN SOCIETY, FEBRUARY 6, 1835, BUT DID NOT FORMALLY PUBLISH A PAPER.

SHORTLY THEREAFTER, SOME OF THIS INFESTED MUSCLE FROM THE DISSECTING-ROOM CAME TO THE ATTENTION OF THE ZOOLOGIST, RICHARD OWEN, WHO DESCRIBED THE ORGANISM AND GAVE IT THE NAME TRICHINA SPIRALIS. (THE NAME TRICHINA SPIRALIS WAS LATER CHANGED TO TRICHINELLA SPIRALIS TO AVOID CONFUSION WITH A PLANT GENUS.)

IN 1866 DR. PAGET SENT AN INFORMAL LETTER TO THE LANCET GIVING THE MORE INTIMATE DETAILS OF HIS DISCOVERY AND AT THE SAME TIME COMPLIMENTING RICHARD OWEN UPON HIS SPLENDID DESCRIPTION OF THE PARASITE.

IT WAS JOSEPH LEIDY (1846) WHO, ACCORDING TO BLUMER (1939), POINTED OUT THAT TRICHINAE WERE PRESENT IN THE MUSCLES OF SWINE AND THAT THESE PARASITES WERE IDENTICAL WITH THE TRICHINA SPIRALIS IN THE MUSCLES OF HUMAN SUBJECTS. BLUMER ALSO STATED THAT LEUCKART (1860) AND VIRCHOW (1864) NOT ONLY DISCOVERED THAT THE PARASITE IN THE MUSCLE WAS THE LARVAL FORM, BUT DEMONSTRATED EXPERIMENTALLY THE DEVELOPMENT OF THE ADULT TYPES.

THE CLINICAL SIGNIFICANCE OF INFESTATION OF MAN WITH TRICHINAE WAS REVEALED BY ZENKER (1860) WHO POINTED OUT THAT THIS WORM WAS NOT A HARMLESS PARASITE DWELLING IN THE BODY, BUT OFTEN THE CAUSE OF A VERY SERIOUS DISEASE WHICH MIGHT RESULT IN DEATH.

POSTMORTEM INCIDENCE IN THE UNITED STATES

INTRODUCTION

IT IS VERY DIFFICULT TO FORMULATE THE FACTS REGARDING THE POSTMORTEM INCIDENCE OF INFESTATION WITH TRICHINAE SINCE THERE IS A WIDE VARIATION IN THE SELECTION OF THE MATERIAL STUDIED, THE AMOUNT OF MUSCLE EMPLOYED AND IN THE METHODS OF EXAMINATION. ALL OF THESE FACTS MUST BE TAKEN INTO CONSIDERATION IN THE STUDY AND COMPARISON OF THE RESULTS OF THE VARIOUS INVESTIGATIONS.

INCIDENCE

DR. W.C.W. GLAZIER (1881) IN AN ATTEMPT TO ASCERTAIN WHAT HAD BEEN DONE IN THE WAY OF SEARCHING FOR TRICHINAE IN CADAVERS IN THE UNITED STATES, WROTE TO THE PROFESSORS OF ANATOMY AND TO THE PATHOLOGISTS IN THE COLLEGES AND HOSPITALS. THE RESULTS OF THIS SURVEY WERE REPORTED TO THE SECRETARY OF THE UNITED STATES TREASURY DEPARTMENT. DR. GLAZIER RECEIVED SEVERAL REPLIES TO HIS INQUIRIES, BUT FEW INDIVIDUALS HAD MADE A REAL SURVEY. HOWEVER, DR. HENRY C. KERBER, SAN FRANCISCO, WROTE DR. GLAZIER THAT IN 1878 HE EXAMINED THIRTEEN CONSECUTIVE CADAVERS FOR TRICHINAE WITH NEGATIVE RESULTS. FROM PROFESSOR J.M. BODINE, MEDICAL DEPARTMENT OF THE UNIVERSITY OF LOUISVILLE, CAME THE REPLY THAT HE HAD RECORDS OF THIRTY TO FORTY AUTOPSIES A YEAR WITH NO INCIDENCE OF TRICHINOSIS. HE ADDED THAT HE HAD NOT HEARD OF ANY TRICHINOSIS IN POSTMORTEM EXAMINATIONS THERE FOR SOME YEARS.

WILLIAMS (1901) REPORTED THAT IN 1891, WHELPLEY OF ST. LOUIS EXAMINED MICROSCOPICALLY SPECIMENS FROM TWENTY CADAVERS IN THE DISSECTING ROOM AND FOUND TRICHINAE IN ONE BODY.

"OF 1000 CONSECUTIVE AUTOPSIES OF WHICH I HAVE NOTES THE TRICHINAE WERE PRESENT IN SIX INSTANCES", REPORTED DR. WILLIAM OSLER (1892) IN HIS PRINCIPLES AND PRACTICE OF MEDICINE.

THORNBURY (1897), ACCORDING TO SAWITZ (1938), IN A MICROSCOPIC EXAMINATION OF TWENTY-ONE DISSECTING-ROOM SUBJECTS IN BUFFALO, NEW YORK, FOUND THREE INFESTED WITH TRICHINELLA SPIRALIS.

IN MAKING MICROSCOPIC EXAMINATIONS OF MUSCLE SAMPLES FROM 505 UNSELECTED AUTOPSIES IN DENVER, BUFFALO AND BALTIMORE, WILLIAMS (1901) FOUND 27 OR 5.3 PER CENT INFESTED WITH TRICHINAE. THE MUSCLES USED WERE THE DIAPHRAGM, STERNOCLEIDO-MASTOID, PSOAS MAGNUS, INTERCOSTALS AND RECTUS ABDOMINIS.

ACCORDING TO SAWITZ (1938), SIMONDS OF ST. LOUIS, MISSOURI, IN 1910 EXAMINED 100 DIAPHRAGMS USING THE DIGESTION METHOD AND FOUND TWO INFESTED WITH TRICHINELLA SPIRALIS.

QUEEN (1931) IN AN EXAMINATION OF 344 DIAPHRAGMS FROM AUTOPSIES IN ROCHESTER, NEW YORK, FOUND 59 OR 17.5 PER CENT

POSITIVE FOR TRICHINAE WHEN 50 GRAMS OF THE MUSCLE WAS DIGESTED. IN ANOTHER SERIES OF 58 DIAPHRAGMS FROM NECROPSIES IN BOSTON, MASSACHUSETTS, 16 OR 27.6 PER CENT WERE FOUND TO BE POSITIVE.

RILEY AND SCHEIFLEY (1934) IN THE EXAMINATION OF 117 CADAVERS IN THE ANATOMICAL LABORATORY OF THE UNIVERSITY OF MINNESOTA, MINNEAPOLIS, FOUND THE INCIDENCE OF INFESTATION WITH TRICHINAE TO BE 17.9 PER CENT.

HINMAN (1936) REPORTED THAT 7 OR 3.5 PER CENT OF 200 DIAPHRAGMS FROM HUMAN AUTOPSIES AT THE CHARITY HOSPITAL, NEW ORLEANS, WERE POSITIVE FOR TRICHINAE WHEN EXAMINED BY THE DIGESTION METHOD.

McNAUGHT AND ANDERSON (1936) OF SAN FRANCISCO, EXAMINED 200 DIAPHRAGMS BY THE DIGESTION METHOD AND FOUND AN INCIDENCE OF 24 PER CENT.

ACCORDING TO MAGATH (1937) 8 PER CENT OF 200 PATIENTS WHO HAD DIED AT THE MAYO CLINIC REVEALED INFESTATION WITH TRICHINELLA SPIRALIS WHEN THE DIAPHRAGM AND THE RECTUS ABDOMINIS AND STERNO-CLEIDO-MASTOID MUSCLES WERE EXAMINED BY THE COMPRESSION METHOD.

SAWITZ (1937) IN A STUDY OF 200 AUTOPSIES FROM THE TOURO INFIRMARY AND CHARITY HOSPITAL, NEW ORLEANS, FOUND 5 PER CENT

CONTAINED TRICHINELLA SPIRALIS. THE DIAPHRAGMS AND PECTORAL MUSCLES WERE EXAMINED BY THE COMPRESSION AND DIGESTION METHODS.

USING THE DIRECT MICROSCOPIC AND THE DIGESTION-BAERMANN METHODS IN THE EXAMINATION OF 300 DIAPHRAGMS FROM CADAVERS COMING FROM TEN HOSPITALS IN WASHINGTON, D.C. AND ONE HOSPITAL IN BALTIMORE, MARYLAND, HALL AND COLLINS (1937) SHOWED 41 DIAPHRAGMS INFESTED WITH TRICHINAE, AN INCIDENCE OF 13.7 PER CENT.

IN A STUDY OF THE DIAPHRAGMS OF 118 CADAVERS FROM MINNEAPOLIS AND ST. PAUL CHARITY HOSPITALS, SCHEIFLEY (1938) REPORTED THAT 12.7 PER CENT WERE FOUND TO CONTAIN TRICHINELLA SPIRALIS WHEN EXAMINED BY THE COMPRESSION METHOD. THIS REPORT WAS COMBINED WITH A PREVIOUS SURVEY ON 117 DISSECTING-ROOM CADAVERS FROM MINNEAPOLIS GIVING 235 CASES WITH AN INCIDENCE OF 14.4 PER CENT.

NOLAN AND BOZICEVICH (1938) EXAMINED BY MEANS OF THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHODS THE DIAPHRAGMS FROM CADAVERS AND FOUND 174 INFESTED WITH TRICHINAE, AN INCIDENCE OF 17.4 PER CENT. OF THESE 1000 CASES, 824 WERE FROM TEN HOSPITALS IN WASHINGTON, D.C., 110 FROM U.S. MARINE HOSPITAL, BALTIMORE AND 66 FROM U.S. NAVAL HOSPITALS AT PHILADELPHIA, PENNSYLVANIA; CHELSEA, MASSACHUSETTS; BROOKLYN, NEW YORK; AND PORTSMOUTH, VIRGINIA.

ACCORDING TO EVANS (1938) A SURVEY OF THE CLEVELAND, OHIO AREA REVEALED AN INCIDENCE OF 23 PER CENT OF INFESTATION

WITH TRICHINAE WHEN THE ENTIRE DIAPHRAGM OF 100 AUTOPSY PATIENTS WAS EXAMINED BY BOTH THE COMPRESSION-MICROSCOPIC AND DIGESTION-BAERMANN METHODS.

IN A PRELIMINARY REPORT ON THE INCIDENCE OF TRICHINOSIS IN ALABAMA, WALKER AND BRECKENRIDGE (1938) EXAMINED THE DIAPHRAGMS, INTERCOSTAL, PECTORAL AND RECTUS ABDOMINIS MUSCLES FROM 100 PATIENTS AT AUTOPSY BY THE DIGESTION AND PRESS METHODS AND FOUND AN INCIDENCE OF 33.0 PER CENT.

POTE (1939) EXAMINED THE DIAPHRAGM, INTERCOSTAL, PECTORAL AND RECTI MUSCLES OF 1060 UNSELECTED AUTOPSIES AT THE BARNES AND ST. LOUIS CITY HOSPITALS BY THE COMPRESSION METHOD AND FOUND 163 OR 15.4 PER CENT CONTAINED TRICHINAE.

BUTT AND LAPEYRE (1939) FOUND THAT IN 170 DIAPHRAGMS, OVER 95 PER CENT OF WHICH WERE OBTAINED FROM THE LOS ANGELES COUNTY HOSPITAL AND EXAMINED BY THE DIGESTION METHOD, 18.2 PER CENT WERE FOUND TO BE INFESTED WITH TRICHINAE.

USING BOTH THE DIGESTION AND PRESS METHODS HOOD AND OLSON (1939) EXAMINED MATERIAL FROM 428 UNSELECTED AUTOPSIES PERFORMED AT SEVERAL CHICAGO HOSPITALS AND FOUND THE INCIDENCE OF INFESTATION WITH TRICHINELLA SPIRALIS WAS 16 PER CENT. OF THE 428 SPECIMENS, 48 WERE FROM INFANTS UNDER ONE YEAR OF AGE. FOUR OR 8.3 PER CENT OF THESE CONTAINED TRICHINAE LARVAE.

IN A STUDY OF DIAPHRAGMS OF 134 PERSONS IN DAYTON, OHIO, OOSTING (1940) REVEALED AN INCIDENCE OF 20.1 PER CENT INFESTATION. APPROXIMATELY ONE-THIRD OF THE DIAPHRAGMS WERE EXAMINED BY BOTH THE DIGESTION AND PRESS METHODS.

CATRON (1940) AT ANN ARBOR, MICHIGAN, REPORTED THAT AN EXAMINATION OF THE DIAPHRAGMS FROM 300 AUTOPSIES BY MICROSCOPIC AND DIGESTION METHODS REVEALED AN INCIDENCE OF 44 OR 14.7 PER CENT OF TRICHINELLA SPIRALIS.

IN A SERIES OF 500 UNSELECTED CONSECUTIVE AUTOPSIES AMONG COUNTY HOSPITAL PATIENTS IN THE DETROIT AREA, GOULD (1940) FOUND 93 INSTANCES OF INFESTATION WITH TRICHINELLA SPIRALIS. THE DIAPHRAGMS AND PECTORAL MUSCLES WERE EXAMINED BY THE MICROSCOPIC PRESS METHOD AND THE DIGESTION-BAERMANN TECHNIQUE.

MELENEY (1941) FOUND THAT AMONG 209 HUMAN DIAPHRAGMS FROM PERSONS DYING IN NASHVILLE, TENNESSEE AT THE VANDERBILT UNIVERSITY HOSPITAL AND THE NASHVILLE GENERAL HOSPITAL, 10 PER CENT WERE FOUND TO BE POSITIVE FOR TRICHINELLA SPIRALIS. THESE WERE EXAMINED BY THE COMBINED DIGESTION AND MICROSCOPIC PRESS METHODS.

IN A STUDY OF MATERIAL FROM 100 BODIES OF PERSONS DYING BY VIOLENCE OR SUDDENLY FROM NATURAL CAUSES IN NEW YORK CITY, MOST AND HELPERN (1941) FOUND THAT 22 PER CENT REVEALED

INFESTATION WITH TRICHINAE WHEN THE DIAPHRAGM, INTERCOSTAL, PECTORAL AND PSOAS MUSCLES WERE EXAMINED BY THE PRESS, DIGESTION AND HISTOLOGICAL METHODS.

KERR, JACOBS AND CAVILLIER (1941) REPORTED THE INCIDENCE OF HUMAN INFESTATION WITH TRICHINAE AS INDICATED BY THE POST-MORTEM EXAMINATION OF 3000 DIAPHRAGMS. THE REPORT IS A COMBINATION OF THEIR WORK AND THAT OF HALL AND COLLINS (1937) AND OF NOLAN AND BOZICEVICH (1938). OF THE 3000 SPECIMENS OF DIAPHRAGMS EXAMINED BY THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHODS, 488 OR 16.3 PER CENT WERE FOUND TO BE INFESTED WITH TRICHINAE.

MATERIAL AND METHODS

THE MATERIAL USED IN THE PRESENT STUDY CONSISTED OF A SERIES OF DIAPHRAGMS REMOVED AT ROUTINE AUTOPSY AT THE LOUISVILLE GENERAL HOSPITAL. THE DIAPHRAGMS OF CHILDREN UNDER ONE YEAR OF AGE WERE NOT INCLUDED IN THE WORK, BUT ASIDE FROM THIS EXCLUSION, THERE WAS NO CONSCIOUS SELECTION OF SUBJECTS.

THE INVESTIGATION HAS BEEN DIVIDED INTO TWO SERIES AND THE RESULTS HAVE BEEN INTERPRETED AND REPORTED SEPARATELY.

SERIES I CONSISTS OF 311 DIAPHRAGMS PLACED DIRECTLY IN 10 PER CENT FORMALIN AND LATER EXAMINED BY THE DIRECT MICROSCOPIC METHOD.

A GRAM OF MUSCLE FROM WHICH TENDINOUS MATERIAL HAD BEEN STRIPPED, TAKEN AT RANDOM FROM VARIOUS PARTS OF THE DIAPHRAGM, WAS TEASED INTO THIN PIECES AND FIRMLY PRESSED BETWEEN TWO GLASS PLATES ($8 \frac{3}{4}'' \times 2 \frac{1}{8}'' \times \frac{1}{4}''$). THESE PLATES WERE HELD IN PLACE BY TWO METAL FRAMES EQUIPPED WITH FOUR BOLTS AND NUTS (FIG. 1). ADJUSTMENT OF THE NUTS FACILITATED APPLICATION OF UNIFORM PRESSURE AND CONSEQUENTLY A THINNER MORE UNIFORM SECTION OF MUSCLE WAS OBTAINED. THIS METHOD IS A MODIFICATION OF THAT EMPLOYED BY NOLAN AND BOZIECEVICH (1938).

SINCE THE DIAPHRAGMS HAD BEEN PRESERVED IN FORMALIN, DATA AS TO THE STATE OF THE CYSTS, THE DEGREE AND LOCALIZATION OF CALCIFICATION, AND WHETHER THE TRICHINAE WERE DEAD OR ALIVE WERE NOT OBTAINED. THE POSITIVE FINDINGS WERE RECORDED IN TERMS OF TRICHINAE PER GRAM AS REVEALED BY THE EXAMINATION OF THE PRESSED PREPARATION USING A WIDE-FIELD MICROSCOPE WITH A 12.5 OCULAR AND 1.7 OBJECTIVE.

THE DIGESTION-BAERMANN AND DIRECT MICROSCOPIC TECHNIQUES WERE EMPLOYED IN SERIES II, THE MATERIAL CONSISTING OF THAT PORTION OF THE FORMALIN-PRESERVED DIAPHRAGMS OF SERIES I WHICH REMAINED AFTER THE GRAM SAMPLES HAD BEEN REMOVED. HOWEVER, THE ATTEMPT AT USING THE DIAPHRAGMS OF SERIES I WAS ABANDONED AFTER TWENTY-SEVEN OF THESE (SOME BEING KNOWN POSITIVES BY THE DIRECT MICROSCOPIC METHOD) FAILED TO REVEAL CYSTS WHEN EXAMINED BY THE DIGESTION METHOD.

SERIES II CONSISTED OF 259 DIAPHRAGMS WHICH HAD BEEN REMOVED AT ROUTINE AUTOPSY AND KEPT IN JARS OF FRESH TAP WATER AT ICEBOX TEMPERATURE UNTIL EXAMINED. THE SPECIMENS WERE REMOVED FROM THE WATER, DRAINED AND CAREFULLY DISSECTED OF ALL FAT, FASCIA AND TENDONS. FOUR 1 CM WIDE STRIPS, TAKEN AT VARYING AND DIFFERENT LOCATIONS ON THE CIRCUMFERENCE OF THE DIAPHRAGM, WERE CUT PARALLEL TO THE DIRECTION OF THE MUSCLE FIBERS. CARE WAS TAKEN TO INCLUDE THE TENDINOUS INSERTIONS OF THESE FIBERS.

THE STRIPS WERE PLACED IN 10 PER CENT FORMALIN AND EXAMINED BY THE DIRECT MICROSCOPIC METHOD AT A LATER DATE. THE METHOD OF EXAMINATION WAS SIMILAR TO THAT USED IN SERIES I. THE FIBERS WERE VERY CAREFULLY TEASED FROM THE FOUR 1-CM WIDE STRIPS AND A COMPOSITE GRAM SAMPLE FROM THE FOUR WAS PRESSED UNIFORMLY AND TO A TRANSPARENCY IN THE COMPRESSOR DESCRIBED PREVIOUSLY. HERE AGAIN, NO ATTEMPT WAS MADE TO DESCRIBE THE STATE OF THE LARVAE OR THE DEGREE OF CALCIFICATION OF THE CYSTS. THE WIDE-FIELD DISSECTING-MICROSCOPE WHICH MAGNIFIES 20 DIAMETERS WAS USED TO ENUMERATE THE TRICHINAE IN THE GRAM SAMPLE.

THE DIGESTION METHOD USED WAS A MODIFICATION OF THE DIGESTION-BAERMANN TECHNIQUE DESCRIBED BY QUEEN (1931). THE PORTION OF THE DIAPHRAGM THAT REMAINED AFTER THE MATERIAL FOR THE DIRECT MICROSCOPIC EXAMINATION HAD BEEN REMOVED WAS FINELY GROUND IN A FOOD CHOPPER AND TO THIS GROUND MATERIAL WAS ADDED FRESHLY PREPARED ARTIFICIAL GASTRIC JUICE (0.5 PER CENT HYDROCHLORIC ACID AND 0.7 PER CENT COMMERCIAL PEP-SIN IN AN AQUEOUS SOLUTION). A LITER OF THIS DIGESTION MATERIAL WAS ADDED TO APPROXIMATELY EACH 50 GM. OF THE GROUND MUSCLE. THE MIXTURE WAS INCUBATED FOR APPROXIMATELY 12 HOURS IN A 4 LITER PYREX PRECIPITATION JAR AT A TEMPERATURE OF 37 C, DURING WHICH TIME CONSTANT STIRRING WAS ACCOMPLISHED BY MEANS OF AN ELECTRICALLY DRIVEN MACHINE (FIG. 11).

AT THE END OF THE PERIOD OF AGITATION AND INCUBATION THE MIXTURE WAS PUT ASIDE FOR TWELVE HOURS TO PERMIT SETTLING. THE SUPERNATANT FLUID WAS CAREFULLY SIPHONED TO WITHIN FOUR INCHES OF THE BOTTOM OF THE JAR, AND THE VOLUME REPLACED WITH TAP WATER AT A TEMPERATURE OF 37-45 C. THE MATERIAL WAS THEN POURED THROUGH CHEESE CLOTH INTO A LARGE MODIFIED BAERMANN FUNNEL (FIG. 111) IN THE BOTTOM OF WHICH RESTED A #3 COORS PORCELAIN DESICCATOR PLATE.

AFTER 12 HOURS THE RUBBER TUBING ATTACHED TO THE STEM OF THE FUNNEL WAS OPENED BY ADJUSTING THE SCREW CLAMP AND THE SEDIMENT WAS COLLECTED IN FOUR 80 ML PYREX TEST TUBES. THREE OF THE TUBES WERE FILLED IN SUCCESSION WITH THE SEDIMENT IN THE BOTTOM OF THE FUNNEL, WHILE THE FOURTH WAS FILLED WITH THE WASHINGS FROM THE PORCELAIN SCREEN AFTER ALL THE LIQUID IN THE FUNNEL HAD BEEN EXPELLED. FOUR 15 ML. CONICAL CENTRIFUGE TUBES WERE FILLED FROM EACH OF THE LARGE TUBES AND CENTRIFUGED 15 MINUTES AT A LOW SPEED. THE SUPERNATANT LIQUID WAS THEN CAREFULLY REMOVED FROM EACH TUBE AND THE SEDIMENT WAS POURED INTO PETRI DISHES. THIS SEDIMENT WAS EXAMINED FOR LARVAE USING A DISSECTING-MICROSCOPE WITH A MAGNIFICATION OF 20 DIAMETERS. THERE WAS NO QUANTITATIVE REPORT AS TO THE LARVAE PER GRAM OF DIGESTED DIAPHRAGM NOR WAS THERE A DESCRIPTION OF THE STATE OF THE PARASITE. THE DETECTION OF LARVAE IN ANY ONE OF THE CENTRIFUGED SEDIMENTS CONSTITUTED A POSITIVE FINDING.

RESULTS

SERIES I

OF THE 311 DIAPHRAGMS EXAMINED BY THE DIRECT MICROSCOPIC METHOD ALONE, 35 OR 11.2 PER CENT WERE FOUND TO CONTAIN TRICHINELLA SPIRALIS. THE MORE IMPORTANT DATA CONCERNING THE GROUP IS SHOWN IN TABLE I.

THE DENSITY OF INFESTATION VARIED FROM ONE CYST PER GRAM TO 4500 CYSTS PER GRAM OF DIAPHRAGM.

THE AGE RANGE OF THE PATIENTS EXAMINED VARIED FROM ONE TO EIGHTY-EIGHT YEARS. OF THE 311 CASES EXAMINED 99 OR 31.8 PER CENT WERE FROM PERSONS LESS THAN 40 YEARS OF AGE AT THE TIME OF DEATH, 188 OR 60.5 PER CENT WERE FROM PEOPLE DYING BETWEEN 40 AND 80 YEARS OF AGE, AND 3 OR 0.9 PER CENT WERE FROM THOSE OVER 80 YEARS OF AGE. THE AGE OF 21 INDIVIDUALS OR 6.8 PER CENT OF THE 311 WAS UNKNOWN. THESE PERSONS WERE DEAD UPON ARRIVAL AT THE HOSPITAL (IN MOST INSTANCES, CORONER'S CASES) OR DYING BEFORE A HISTORY COULD BE OBTAINED.

THE AGE INCIDENCE OF TRICHINELLA SPIRALIS INFESTATION IN THIS STUDY IS SHOWN IN TABLE III. OF THE 23 DIAPHRAGMS IN THE FIRST TWO DECADES OF LIFE, ONLY ONE, THAT OF A BOY SIXTEEN YEARS OF AGE, SHOWED PRESENCE OF TRICHINAE. FOUR PER CENT OF THE 20-29 AGE GROUP AND 8.1 PER CENT OF THE 40-49 AGE GROUP REVEALED INFESTATION WITH TRICHINELLA

SPIRALIS. IN THE OTHER DECADES (THROUGH THE SEVENTH) THE INCIDENCE WAS OVER 13 PER CENT. THE HIGHEST INCIDENCE (18.4 PER CENT) FELL IN THE 70-79 AGE GROUP. THE HIGHEST PER CENT (22.8) OF THE 35 POSITIVE CASES FELL IN THE 60-69 AGE GROUP.

THE INCIDENCE AS TO COLOR AND SEX IS RECORDED IN TABLE V. OF THE 311 CASES EXAMINED 184 WERE MALES AND 108 FEMALES. THE SEX AND COLOR OF 19 PATIENTS WERE NOT RECORDED. TWENTY-TWO OR 11.9 PER CENT OF THE 184 MALES EXAMINED AND 12 OR 11.1 PER CENT OF THE 108 FEMALES WERE INFESTED WITH TRICHINAE. ONE POSITIVE DIAPHRAGM OCCURRED AMONG THE 19 WITH NO HISTORY. OF THE 292 PERSONS WITH A RECORD AS TO SEX AND COLOR, 171 WERE WHITE, 14 OR 8.2 PER CENT BEING INFESTED WITH TRICHINAE. TWENTY OR 16.5 PER CENT OF THE 121 COLORED PATIENTS HARBORED ENCYSTED LARVAE. THE HIGHEST INCIDENCE (18.1 PER CENT) OCCURRED IN COLORED MALES. THE LOWEST INCIDENCE (7.5 PER CENT) OCCURRED IN WHITE FEMALES. THE WHITE MALES SHOWED AN INCIDENCE OF 8.4 PER CENT; THE COLORED FEMALES, 14.5 PER CENT.

SERIES II

OF THE 259 DIAPHRAGMS EXAMINED BY BOTH THE DIRECT MICROSCOPIC AND DIGESTION METHODS, 54 OR 20.8 PER CENT SHOWED THE PRESENCE OF TRICHINELLA SPIRALIS. OF THESE 54 POSITIVE CASES 13 OR 24.1 PER CENT WERE NOT DETECTED BY THE DIGESTION

METHOD WHILE 7 OR 12.9 PER CENT WERE NOT REVEALED BY THE DIRECT MICROSCOPIC METHOD. THIRTY-FOUR OR 63.0 PER CENT WERE POSITIVE BY BOTH THE DIRECT MICROSCOPIC AND THE DIGESTION-BAERMANN METHODS. BY THE DIGESTION METHOD 41 OR 15.8 PER CENT OF THE TOTAL NUMBER OF DIAPHRAGMS EXAMINED WERE POSITIVE. BY THE DIRECT MICROSCOPIC METHOD 47 OR 18.1 PER CENT OF THE TOTAL NUMBER OF DIAPHRAGMS EXAMINED WERE POSITIVE. OF THE TOTAL NUMBER OF POSITIVES 75.9 PER CENT WERE DETECTED BY THE DIGESTION METHOD AND 87.0 PER CENT OF THE TOTAL NUMBER OF POSITIVE CASES WERE DETECTED BY THE DIRECT METHOD.

THE MORE IMPORTANT DATA CONCERNING THESE POSITIVE CASES ARE SHOWN IN TABLE II.

THE DENSITY OF INFESTATION AS DETERMINED BY THE DIRECT MICROSCOPIC METHOD VARIED FROM 2 CYSTS PER GRAM TO 73 CYSTS PER GRAM OF DIAPHRAGM. SINCE THE DIGESTION-BAERMANN TECHNIQUE WAS NOT CARRIED OUT QUANTITATIVELY, IT WAS ASSUMED THAT IF THE DIRECT MICROSCOPIC TEST ON A DIAPHRAGM FAILED TO REVEAL ANY ORGANISMS AND TRICHINAE WERE FOUND BY THE DIGESTION-BAERMANN TECHNIQUE, THE DIAPHRAGM CONTAINED LESS THAN TWO CYSTS PER GRAM.

THE AGE RANGE OF THIS SERIES VARIED FROM ONE TO EIGHTY-SIX YEARS. OF THE DIAPHRAGMS EXAMINED 70 OR 27.0 PER CENT WERE FROM PERSONS LESS THAN 40 YEARS OF AGE, 174 OR 67.2

PER CENT WERE FROM PEOPLE DYING BETWEEN 40 AND 80 YEARS OF AGE, AND 6 OR 2.3 PER CENT WERE FROM THOSE OVER 80 YEARS OF AGE. THE AGE OF 9 INDIVIDUALS OR 3.5 PER CENT OF THE 259 IS UNKNOWN. THE INDIVIDUALS WERE DEAD UPON ARRIVAL AT THE HOSPITAL OR DIED BEFORE A HISTORY COULD BE OBTAINED.

THE AGE INCIDENCE BY DECADES IN THIS SERIES IS SHOWN IN TABLE IV. ONLY ONE DIAPHRAGM OF THE 25 EXAMINED THAT FELL IN THE FIRST TWO DECADES OF LIFE CONTAINED TRICHINAE. THIS WAS A DIAPHRAGM OF A WHITE MALE SEVENTEEN YEARS OF AGE. THE LOWEST PERCENTAGE OF POSITIVES OCCURRING IN THE OTHER SEVEN DECADES OF LIFE WAS 13.3 PER CENT. THIS OCCURRED IN THE 20-29 AGE GROUP. FIFTY PER CENT, I.E., 3 OF THE 6 CASES IN THE 80-89 AGE GROUP WERE POSITIVE. OF THE 54 POSITIVE CASES THE HIGHEST INCIDENCE (25.9 PER CENT) WAS IN THE 60-69 AGE GROUP.

THE INCIDENCE BY SEX AND COLOR IS RECORDED IN TABLE V. OF THE 259 CASES EXAMINED, 182 WERE MALES AND 72 FEMALES. THE SEX AND COLOR OF 5 PATIENTS WERE NOT RECORDED. OF THE 182 MALES EXAMINED 31 OR 17.0 PER CENT WERE INFESTED WITH TRICHINAE. TWENTY-TWO OR 30.5 PER CENT OF THE 72 FEMALES WERE FOUND TO BE PARASITIZED. ONE POSITIVE DIAPHRAGM OCCURRED AMONG THE FIVE HAVING NO HISTORY. OF THE 254 PERSONS WITH A RECORD AS TO SEX AND RACE, 154 WERE WHITE AND 31 (20.0 PER CENT) OF THESE WERE INFESTED WITH TRICHINELLA SPIRALIS.

TWENTY-TWO PER CENT OF THE 100 COLORED PATIENTS HARBORED ENCYSTED TRICHINAE. THE HIGHEST INCIDENCE (33.3 PER CENT) OCCURRED IN WHITE FEMALES. THE LOWEST INCIDENCE (15.6 PER CENT) OCCURRED IN WHITE MALES. THE COLORED MALES SHOWED AN INCIDENCE OF 19.4 PER CENT AND THE COLORED FEMALES 27.2 PER CENT.

A DIFFERENTIAL BLOOD COUNT WAS PERFORMED IN 24 OF THE 35 PATIENTS WHOSE DIAPHRAGMS WERE EXAMINED IN SERIES I. OF THESE 24 PATIENTS ONLY 6 SHOWED EOSINOPHILS, THE GREATEST NUMBER IN ANY INSTANCE BEING 2.0 PER CENT OF THE TOTAL COUNT. OF THE 41 PATIENTS IN SERIES II WHOSE DIAPHRAGMS CONTAINED TRICHINAE AND UPON WHOM A DIFFERENTIAL BLOOD COUNT WAS MADE, ONLY 13 WERE FOUND TO HAVE EOSINOPHILS. THE HIGHEST INCIDENCE WAS 4.0 PER CENT, THERE BEING NO EOSINOPHILS IN 28 OF THE 41 PATIENTS.

DISCUSSION

AS HAS BEEN PREVIOUSLY STATED, THE DIAPHRAGMS USED IN THIS STUDY WERE THOSE REMOVED AT ROUTINE AUTOPSY AT THE LOUISVILLE GENERAL HOSPITAL. ASIDE FROM THE EXCLUSION OF CHILDREN UNDER ONE YEAR OF AGE, THERE WAS NO SELECTION OF SPECIMENS AS TO AGE, SEX, COLOR, OCCUPATION OR CLINICAL HISTORY OF THE PATIENTS.

THE PRESENCE OF THE ORGANISMS WAS NOT SUSPECTED CLINICALLY IN ANY OF THE 89 INDIVIDUALS WHO HARBORED THE CYSTS. SEVERAL PATIENTS GAVE VAGUE HISTORIES OF RHEUMATISM OR "GROWING PAINS", BUT THESE SYMPTOMS COULD WELL BE ATTRIBUTED TO SOME CONDITION OTHER THAN INFESTATION WITH TRICHINAE.

IT WAS FOUND THAT THERE WAS A MARKED DIFFERENCE IN THE INCIDENCE OF INFESTATION WITH TRICHINAE AS DETERMINED BY THE DIRECT MICROSCOPIC EXAMINATION OF THE DIAPHRAGMS OF SERIES I AND THAT DETECTED BY THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHODS IN SERIES II. A SIGNIFICANT DIFFERENCE BETWEEN THE RESULTS OF THE TWO SERIES AS DETERMINED BY THE CHI SQUARE AND STANDARD ERROR TESTS MAKES A COMBINED REPORT INADVISABLE.

THE INCIDENCE OF INFESTATION WITH TRICHINELLA SPIRALIS AS DETERMINED BY THE DIRECT MICROSCOPIC METHOD IN SERIES I WAS 11.2 PER CENT, WHILE THE USE OF THE DIRECT METHOD IN SERIES II REVEALED AN INCIDENCE OF 18.1 PER CENT. DIFFERENT INDIVIDUALS CARRIED OUT THE TWO SERIES OF STUDY AND THIS

MAY ACCOUNT, IN PART, FOR THE DIFFERENCE IN THE RESULTS OF THE TWO SERIES. HOWEVER, IT SEEMS MORE LIKELY THAT THE DIFFERENCE IS ATTRIBUTABLE TO THE MANNER OF SELECTION OF THE SAMPLES AND THE AMOUNT OF DIAPHRAGM EMPLOYED IN THE TEST. IN SERIES I THE GRAM OF MUSCLE WAS TAKEN AT RANDOM FROM VARIOUS PARTS OF THE DIAPHRAGM, CUT INTO SMALL PIECES AND PRESSED. IN SERIES II FOUR 1CM WIDE STRIPS WERE CUT PARALLEL TO THE DIRECTION OF THE MUSCLE FIBERS AT VARYING AND DIFFERENT LOCATIONS ON THE CIRCUMFERENCE OF THE DIAPHRAGM. VERY THIN STRIPS WERE ALTERNATELY TEASED FROM THESE SAMPLES, AND A GRAM OF THE COMPOSITE WAS PRESSED BETWEEN THE GLASS PLATES; THUS PROVIDING A MORE TRANSPARENT AND REPRESENTATIVE SAMPLE THAN THAT EMPLOYED IN SERIES I.

THIS WAS NOT A STUDY FOR THE COMPARISON OF THE DIRECT MICROSCOPIC TEST AND THE DIGESTION-BAERMANN METHOD OF EXAMINATION FOR TRICHINELLA SPIRALIS. HOWEVER, IT IS INTERESTING TO NOTE THAT IN SERIES II THE DIRECT MICROSCOPIC METHOD FAILED TO DETECT 7 OF THE 54 POSITIVES WHILE THE DIGESTION METHOD DID NOT REVEAL 13 OF THE POSITIVE DIAPHRAGMS. THE DIGESTION METHOD DETECTED 75.9 PER CENT OF THE TOTAL NUMBER OF POSITIVES WHILE THE DIRECT MICROSCOPIC METHOD DETECTED 87.0 PER CENT OF THE TOTAL POSITIVES.

THE DIGESTION METHOD IS BOTH EXPENSIVE AND TIME CONSUMING. HOWEVER, IT IS VALUABLE IN DETECTING LIGHT INFESTATIONS AND

SHOULD CONSTITUTE A PART IN SURVEYS UNDERTAKEN TO DETERMINE THE PROBABLE INCIDENCE OF TRICHINOSIS INFESTATION IF THE SURVEYS ARE TO SERVE AS AN INDEX TO THE INCIDENCE AMONG REPRESENTATIVE LIVING POPULATIONS OR AREAS.

IT IS TRUE THAT THE DIRECT MICROSCOPIC EXAMINATION OF A DIAPHRAGM IN ONE INSTANCE REVEALED THE DENSITY OF INFESTATION TO BE 38 CYSTS PER GRAM WHILE THE DIGESTION-BAERMANN PROCEDURE FAILED TO DETECT ANY CYSTS OR LARVAE. IT SEEMS THAT THE CALCIFICATION OF CYSTS IN A HEAVILY INFESTED MUSCLE LEADS TO THE DISSOLUTION OF THESE CYSTS IN THE DIGESTION FLUID.

THE THEORY OF THE RELATIONSHIP BETWEEN THE RAPIDITY WITH WHICH TRICHINAE DIE AND CALCIFY AND THE DEGREE OF INFESTATION WAS FIRST SUGGESTED BY HALL AND COLLINS IN 1937. THEY STATE THAT THE DIGESTION-BAERMANN EXAMINATION WILL DETECT A LIGHT INFESTATION WITH LIVING TRICHINAE, BUT THAT NEITHER THE DIRECT MICROSCOPIC NOR THE DIGESTION TECHNIQUE WILL PICK UP VERY LIGHT INFESTATION WITH DEAD TRICHINAE EXCEPT ACCIDENTALLY.

THE 20.8 PER CENT INCIDENCE OF INFESTATION WITH TRICHINAE AS DETERMINED BY THE COMBINED DIRECT MICROSCOPIC AND DIGESTION-BAERMANN TESTS IS RATHER HIGH FOR THIS AREA OF THE COUNTRY. THE SOUTHERN STATES HAVE, ACCORDING TO OTHER INVESTIGATORS, A MUCH LOWER INCIDENCE OF TRICHINOSIS THAN THAT REPORTED

IN OTHER GEOGRAPHICAL SECTIONS OF THE UNITED STATES. WALKER AND BRECKENRIDGE (1938) REPORTED AN INCIDENCE OF 33.0 PER CENT IN ALABAMA, BUT THE STUDY WAS NOT BASED ON THE EXAMINATION OF DIAPHRAGMS ALONE.

THE LOW INCIDENCE OF TRICHINOSIS IN THE SOUTH IS EXPLAINED BY THE FACT THAT THE MAJORITY OF THE HOGS IN THAT AREA ARE PEANUT OR GRAIN-FED, WHILE MANY OF THOSE IN MORE DENSELY POPULATED SECTIONS OF THE COUNTRY ARE GARBAGE-FED. IT IS BELIEVED THAT THE HOGS IN THE VICINITY OF LOUISVILLE ARE, FOR THE MOST PART, GRAIN-FED. ACCORDING TO ADAMS (1942), 0.2 PER CENT OF 1000 DIAPHRAGMS OF HOGS COLLECTED FROM LOUISVILLE ABATTOIRS REVEALED TRICHINAE WHEN EXAMINED BY THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHODS.

THE GREATER PART OF THE PORK CONSUMED BY THE PEOPLE OF LOUISVILLE IS FROM HOGS THAT HAVE BEEN SLAUGHTERED IN THE LOCAL ABATTOIRS. LOUISVILLE MAINTAINS MEAT INSPECTION AND SLAUGHTER-HOUSE ORDINANCES, AND NO MEAT IS PLACED ON THE LOCAL MARKET UNTIL IT HAS BEEN INSPECTED AND PASSED BY A DULY AUTHORIZED INSPECTOR OF THE UNITED STATES GOVERNMENT OR BY AN AUTHORIZED INSPECTOR OF THE LOUISVILLE AND JEFFERSON COUNTY HEALTH DEPARTMENT.

IT IS POSSIBLE THAT THE HIGH INCIDENCE OF INFESTATION WITH TRICHINAE OF PATIENTS AT THE LOUISVILLE GENERAL HOSPITAL MAY NOT BE REPRESENTATIVE OF THE POPULATION AS A WHOLE.

A LARGE PERCENTAGE OF THE PATIENTS AT THE HOSPITAL ARE CHARITY PATIENTS OR PATIENTS ABLE TO PAY ONLY A SMALL PART OF THEIR FEES. THE ECONOMIC AND SOCIAL STATUS OF THESE PATIENTS IS LOW AND MAY ACCOUNT FOR THE HIGH INCIDENCE OF INFESTATION WITH TRICHINELLA SPIRALIS.

THE RECORDS AS TO THE PERIODS OF RESIDENCY IN THE CITY ARE INCOMPLETE, AND IT IS REASONABLE TO SUPPOSE THAT SOME OF THESE INDIVIDUALS SPENT ALMOST THEIR ENTIRE LIVES IN THE RURAL DISTRICT OR IN OTHER LOCALITIES.

THE INCIDENCE OF INFESTATION AS TO AGE GROUPS IS AS MAY BE EXPECTED. THE LIGHT INFESTATIONS OCCUR IN CHILDREN AND YOUNG ADULTS, THE INCIDENCE INCREASING WITH AGE UNTIL THAT TIME IS REACHED WHEN THE AMOUNT OF MEAT IN THE DIET OF THE AGED AGAIN BECOMES LIMITED.

IT WAS FOUND THAT THERE WAS NO APPRECIABLE DIFFERENCE IN THE INCIDENCE OF INFESTATION IN THE WHITE AND COLORED POPULATIONS. THE 30.5 PER CENT INCIDENCE OF INFESTATION OF FEMALES AS COMPARED WITH THE 17.0 PER CENT IN THE MALES IS OF SOME PROBABLE SIGNIFICANCE. THERE IS NOT A COMPLETE HISTORY OF THE PATIENTS AS TO OCCUPATION, BUT IT SEEMS LIKELY THAT THE LARGE NUMBER OF WOMEN, BOTH WHITE AND COLORED, ENGAGED IN GENERAL HOUSEWORK AND HANDLING OF FOOD MIGHT ACCOUNT FOR THIS HIGHER INCIDENCE.

THE ABSENCE OF AN EOSINOPHILIC ELEVATION IN THESE PATIENTS WHO HARBORED PARASITES WAS NOT UNEXPECTED. APPARENTLY IN OLD INFESTATIONS WITH TRICHINAE, EOSINOPHILIA IS USUALLY ABSENT.

EVEN THOUGH TRICHINOSIS HAS BEEN A REPORTABLE DISEASE IN LOUISVILLE SINCE 1917, AN EXAMINATION OF THE CITY HEALTH DEPARTMENT RECORDS FOR THE PAST NINE YEARS FAILED TO DISCLOSE A SINGLE CASE.

SUMMARY

THE DIRECT MICROSCOPIC EXAMINATION OF 311 HUMAN DIAPHRAGMS FROM ROUTINE AUTOPSIES AT THE LOUISVILLE GENERAL HOSPITAL REVEALED AN 11.2 PER CENT INCIDENCE OF TRICHINELLA SPIRALIS.

A SECOND SERIES OF EXAMINATIONS USING BOTH THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHODS DETECTED AN INCIDENCE OF 20.8 PER CENT IN THE 259 DIAPHRAGMS STUDIED.

NO SELECTION OF MATERIAL WAS MADE WITH THE EXCEPTION THAT THE DIAPHRAGMS OF ALL CHILDREN UNDER ONE YEAR OF AGE WERE EXCLUDED.

THE INCIDENCE OF HUMAN INFESTATION WITH TRICHINAE IN LOUISVILLE IS SOMEWHAT HIGHER THAN THAT REPORTED BY OTHER INVESTIGATORS IN STUDIES OF HUMAN DIAPHRAGMS TAKEN AT AUTOPSY IN VARIOUS OTHER CITIES IN THE SOUTHERN PART OF THE UNITED STATES.

NOTE: IT IS KNOWN TO THE AUTHOR THAT AT LEAST SOME OF THE PATIENTS HAVE PRESENTED THE CLINICAL PICTURE OF TRICHINOSIS AND GIVEN A POSITIVE REACTION TO THE SKIN TEST ANTIGEN. (PERSONAL COMMUNICATION FROM DR. MALCOLM L. BARNES)

TABLE I

DATA CONCERNING 35 INSTANCES OF TRICHINOSIS IN SERIES I

SERIAL NUMBER	AUTOPSY NUMBER	HOSPITAL NUMBER	AGE	SEX	COLOR	PER CENT EOSINO- PHILS IN BLOOD	DIRECT MICROSCOPIC METHOD
							CYSTS PER GRAM
1	A-39-6	30711	16	M	W	0	1
2	-23	31075	59	M	C	2	1
3	-47	31613	29	F	C	N.D.	4
4	-85	32082	40	F	C	0	13
5	-120	32521	74	M	W	0	1
6	-143	29072	46	F	W	0	4
7	-148	40976	64	F	C	0	51
8	-157	32810	34	F	C	0	1
9	-158	3189	39	M	C	N.D.	2
10	-160	32643	67	M	W	0	1
11	-193	32989	57	M	C	0	2
12	-198	33149	55	M	C	N.D.	3
13	-200	31797	61	M	W	0	2
14	-203	27689	58	F	C	1	75
15	-206	15624	68	M	C	0	6
16	-218	33376	60	F	C	N.D.	4
17	-251	33713	39	F	C	0	4500
18	-254	2246	72	F	W	0	3
19	-255	33925	34	M	W	N.D.	1
20	-261	34009	40	M	W	N.D.	2
21	-298	34668	59	M	C	N.D.	2
22	-303	34776	71	M	W	N.D.	4
23	-309	34953	37	M	C	1	3
24	-326	51817	79	M	C	2	3
25	-333	35386	61	M	W	N.D.	1
26	-334	39741	30	M	C	0	2
27	-336	45706	60	M	C	N.D.	408
28	-346	53281	79	M	C	0	5
29	-372	35737	49	F	C	0	1
30	-382	32562	54	M	W	0	3
31	A-40-8	35874	74	F	W	0	8
32	-29	75192	36	M	W	0	1
33	-71	75286	62	F	W	1	1
34	-88	15963	71	M	W	1	3
*35	-	-	-	-	-	-	3

*TAG LOST, DIAPHRAGM SAVED.

N.D. = NO BLOOD COUNT MADE.

TABLE II

DATA CONCERNING 54 CASES OF TRICHINOSIS IN SERIES II

SERIAL NUMBER	AUTOPSY NUMBER	HOSPITAL NUMBER	AGE	SEX	COLOR	PER CENT EOSINO- PHILS IN BLOOD	DIRECT MICROSCOPIC METHOD	CYSTS PER GRAM	DIGESTION METHOD
1	A-40-170	27527	60	F	C	0	Pos.	15	Pos.
2	-174	59769	68	F	C	N.D.	Pos.	20	Pos.
3	-189	77996	86	M	C	N.D.	Pos.	8	NEG.
4	-194	77565	59	M	C	2	Pos.	4	Pos.
5	-201	4806	68	F	C	0	Pos.	70	Pos.
6	-222	37994	66	M	C	0	Pos.	5	Pos.
7	-226	78597	44	F	C	0	Pos.	10	NEG.
8	-231	78874	53	M	W	0	Pos.	2	NEG.
9	-235	40520	37	M	W	0	Pos.	2	NEG.
10	-237	18092	57	F ⁷	W	0	Pos.	4	NEG.
11	-243	16309	55	F	W	0	Pos.	2	Pos.
12	-255	52497	49	F	W	0	Pos.	2	NEG.
13	-258	56183	66	M	W	1	Pos.	4	NEG.
14	-263	32493	54	M	W	2	NEG.	0	Pos.*
15	-264	3044	57	F	W	1	NEG.	0	Pos.*
16	-266	79438	64	M	C	0	Pos.	4	Pos.
17	-281	9670	67	M	W	1	Pos.	34	Pos.
18	-291	35367	44	F	W	3	Pos.	4	NEG.
19	A-41-2	63733	45	F	C	2	Pos.	10	Pos.
20	-13	80328	40	M	W	0	Pos.	38	NEG.
21	-28	80245	45	F	C	0	NEG.	0	Pos.*
22	-48	17904	52	M	W	1	Pos.	4	Pos.
23	-49	80982	60	F	C	N.D.	Pos.	4	Pos.
24	-51	80948	70	M	C	N.D.	Pos.	40	Pos.
25	-58	81080	83	M	W	N.D.	Pos.	4	Pos.
26	-65	81170	82	F	W	0	Pos.	6	Pos.
27	-72	33742	65	M	C	0	Pos.	2	Pos.
28	-82	55136	29	F	W	0	Pos.	10	Pos.
29	-107	76168	51	M	W	4	NEG.	0	Pos.*

TABLE II (CONT'D)

DATA CONCERNING 54 CASES OF TRICHINOSIS IN SERIES II

SERIAL NUMBER	AUTOPSY NUMBER	HOSPITAL NUMBER	AGE	SEX	COLOR	PER CENT EOSINO- PHILS IN BLOOD	DIRECT MICROSCOPIC METHOD	CYSTS - PER GRAM	DIGESTION METHOD
30	A-41-137	82876	65	M	W	N.D.	Pos.	4	Pos.
31	-141	82668	73	F	W	0	Pos.	73	Pos.
32	-145	36598	71	M	W	0	Pos.	3	Pos.
33	-153	79554	67	F	W	0	Pos.	2	NEG.
34	-154	70770	72	F	C	0	Pos.	4	NEG.
35	-165	83236	56	M	W	N.D.	Pos.	4	Pos.
36	-183	83585	-	M	C	N.D.	NEG.	0	Pos.*
37	-194	83587	68	F	W	1	NEG.	0	Pos.*
38	-211	83854	73	M	W	0	Pos.	8	Pos.
39	-239	72820	67	M	W	1	Pos.	3	Pos.
40	-256	28495	57	F	W	0	Pos.	6	Pos.
41	-257	84211	34	M	W	3	Pos.	2	Pos.
42	-286	84733	67	M	W	N.D.	Pos.	3	Pos.
43	-290	84759	34	M	C	0	Pos.	6	Pos.
44	-297	84856	50	M	C	N.D.	Pos.	7	Pos.
45	-302	84845	47	M	C	1	NEG.	0	Pos.*
46	-324	85341	54	M	C	N.D.	Pos.	14	Pos.
47	A-42-8	79861	32	M	W	0	Pos.	14	NEG.
48	-14	79409	37	F	C	0	Pos.	2	NEG.
49	-15	43863	17	M	W	0	Pos.	5	Pos.
50	-28	85889	30	M	C	0	Pos.	3	Pos.
51	-29	85848	26	F	W	0	Pos.	10	Pos.
52	-52	86255	76	F	W	0	Pos.	21	Pos.
53	-64	13352	75	M	C	N.D.	Pos.	32	Pos.
**54	-	-	-	-	-	-	Pos.	11	Pos.

*LESS THAN 2 CYSTS PER GRAM.

**TAG LOST, DIAPHRAGM SAVED.

N.D. = NO BLOOD COUNT MADE.

TABLE III

SERIES I*

AGE DISTRIBUTION OF TOTAL DIAPHRAGMS
EXAMINED FOR THE PRESENCE OF TRICHINELLA SPIRALIS

<u>AGE</u>	<u>DIAPHRAGMS EXAMINED</u>	<u>POSITIVE DIAPHRAGMS</u>	<u>PER CENT POSITIVE</u>	<u>PERCENTAGE DISTRIBUTION-TOTAL POSITIVES</u>
1-9	11	0	0.0	0.0
10-19	12	1	8.3	2.9
20-29	25	1	4.0	2.9
30-39	51	7	13.7	20.0
40-49	49	4	8.1	11.4
50-59	45	6	13.3	17.1
60-69	56	8	14.2	22.8
70-79	38	7	18.4	20.0
80 AND OVER	3	0	0.0	0.0
**UNKNOWN	21	1	4.7	2.9
TOTAL	311	35	11.2	100.0

*DIAPHRAGMS EXAMINED BY DIRECT MICROSCOPIC METHOD ONLY.

**TAGS WERE LOST, DIAPHRAGMS SAVED.

TABLE IV

SERIES II*

AGE DISTRIBUTION OF TOTAL DIAPHRAGMS
EXAMINED FOR THE PRESENCE OF TRICHINELLA SPIRALIS

<u>AGE</u>	<u>DIAPHRAGMS EXAMINED</u>	<u>POSITIVE DIAPHRAGMS</u>	<u>PERCENT POSITIVE</u>	<u>PERCENTAGE DISTRIBUTION OF TOTAL POSITIVES</u>
1-9	13	0	0.0	0.0
10-19	12	1	8.3	1.8
20-29	15	2	13.3	3.7
30-39	30	6	20.0	11.1
40-49	40	7	17.5	13.0
50-59	53	12	22.6	22.2
60-69	51	14	27.4	25.9
70-79	30	7	23.3	13.0
80 AND OVER	6	3	50.0	5.6
**UNKNOWN	9	2	22.2	3.7
TOTAL (ALL AGES)	259	54	20.8	100.0

*DIAPHRAGMS EXAMINED BY BOTH THE DIRECT MICROSCOPIC AND DIGESTION-BAERMANN METHOD.

**TAGS WERE LOST, DIAPHRAGMS SAVED.

TABLE V

INCIDENCE OF TRICHINELLA SPIRALIS DISTRIBUTED TO SEX AND COLOR

GROUP	SERIES I			SERIES II		
	DIAPHRAGMS EXAMINED BY THE DIRECT MICROSCOPIC METHOD ONLY			DIAPHRAGMS EXAMINED BY BOTH THE DIRECT MICROSCOPIC AND DIGESTION METHODS		
	NUMBER EXAMINED	NUMBER INFESTED	PER CENT INFESTED	NUMBER EXAMINED	NUMBER INFESTED	PER CENT INFESTED
MALES (TOTAL)	184	22	11.9	182	31	17.0
WHITE	118	10	8.4	115	18	15.6
COLORED	66	12	18.1	67	13	19.4
FEMALES (TOTAL)	108	12	11.1	72	22	30.5
WHITE	53	4	7.5	39	13	33.3
COLORED	55	8	14.5	33	9	27.2
*UNKNOWN SEX AND RACE	19	1	5.2	5	1	20.0
TOTAL EXAMINED	311	35	11.2	259	54	20.8

*TAGS WERE LOST, DIAPHRAGMS SAVED.

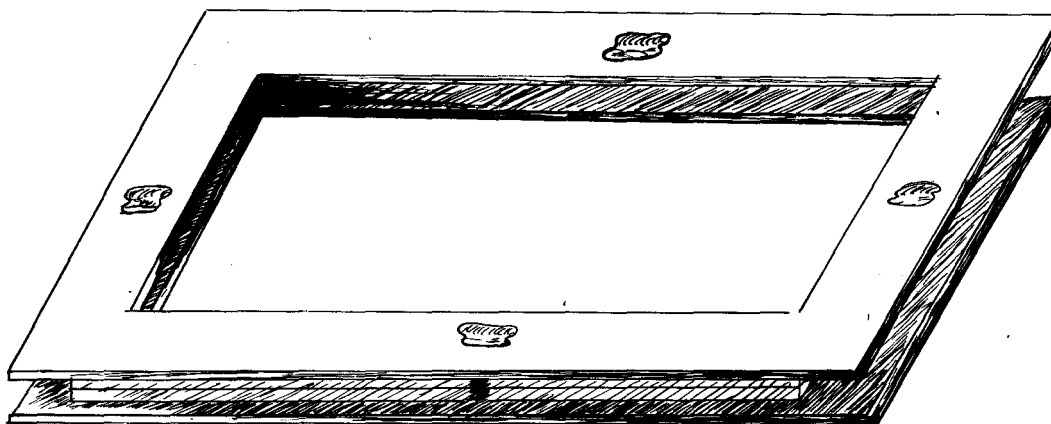


FIGURE 1

COMPRESSOR FOR DIRECT
MICROSCOPIC EXAMINATION

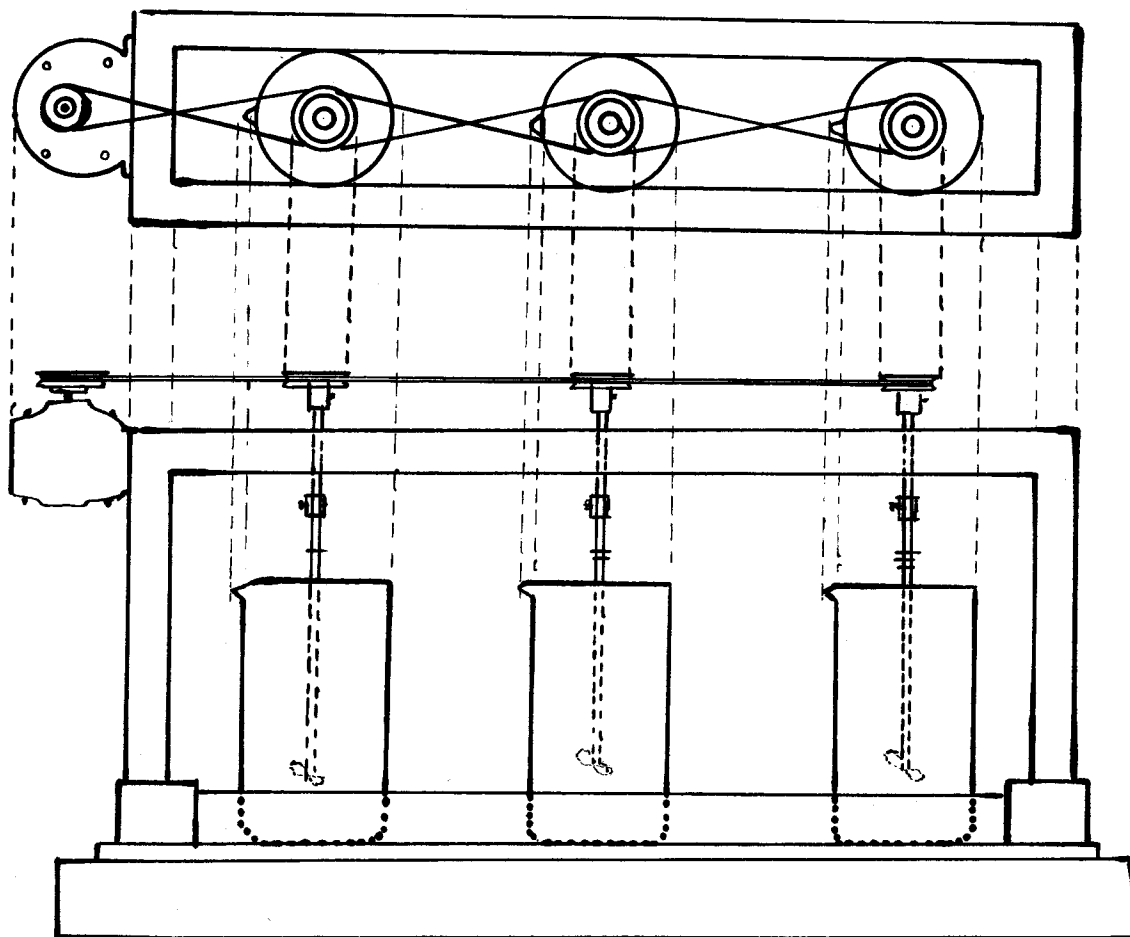


FIGURE 11
DIGESTION APPARATUS

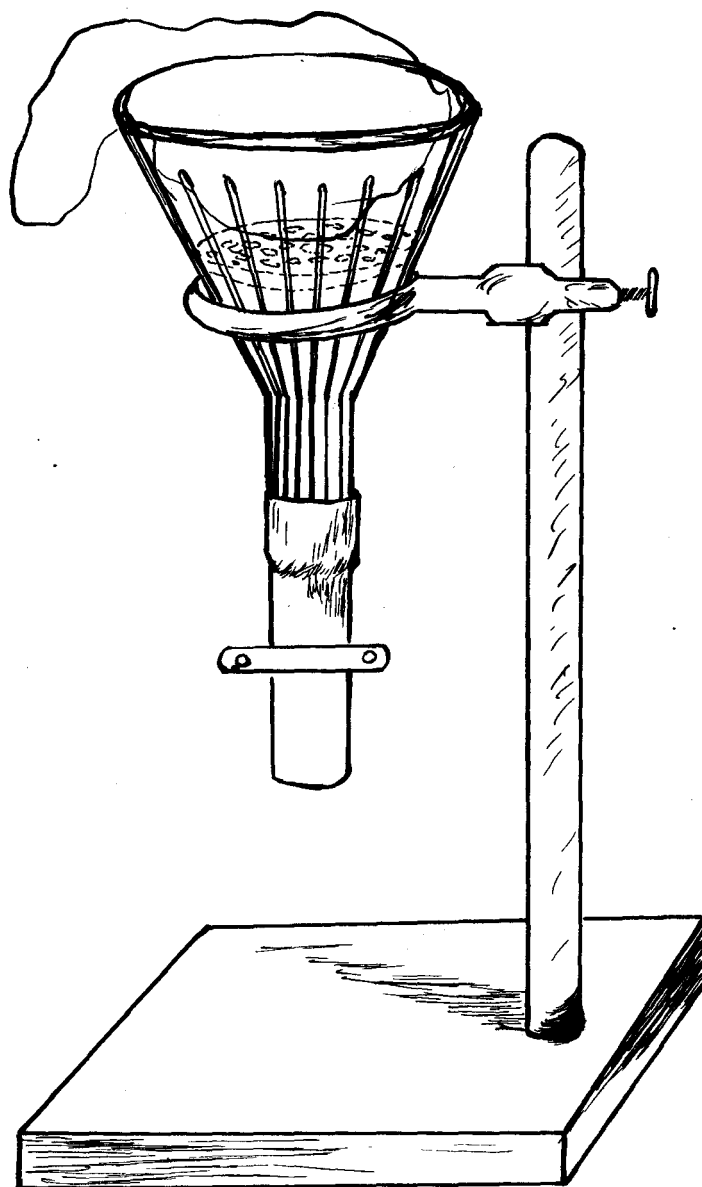


FIGURE III

BAERMANN APPARATUS

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